## MAXIMS IN CONSTRUCTION.*

1. To collect physical facts, to deduce laws, and to apply them to circumstances, such is the progressive operation of the mind in the study and application of *construction*.—*Laroix.*

2. Construction has for its laws the principles which govern matter; for materials, the productions of the vegetable and mineral world; and for its end, resistance to weight, a successful struggle with the elements, and victory over decay.

3. There are three leading points of view under which to regard all construction—statical, qualitative, quantitative. Statical relates to the disposition of the masses: the two latter points refer to the quality and quantity of the materials which have a mutual relation and control as to solidity and stability.

4. It is incorrect to regard decay and destruction as entire annihilation of substance. Decay is but a species of transition from one state to another. The first elements of any substance, which is reduced to a powder, sublimated to a vapour, or converted into a gas or steam, still exist in another form, assuming a new combination.

5. Ignorance, haste, and parsimony are three great enemies to substantial construction.

6. The rot in timber germinates in damp, expands in heat, but shrinks and dies in perfect ventilation.

7. Green wood laid in peat will last for ages.

8. Expansion and contraction, the effects of temperature, are constantly operating in all construction the most solid, in all materials even the most dense. Hence a perpetual movement destructive of cohesion, and by disintegration inducing decay.

9. Water is the most destructive agent to construction. There is no quantity so small, which, if repeated, is not ultimately fatal. The softest as well as the hardest material must yield to its insidious attack. No adage more true than "Gutta cavat lapidem."

10. Our forefathers knew the connection between moisture and decay in soft material. Hence in the buildings of the districts where the soft stones prevail, the bottom courses of the walls will frequently be found to be formed of a hard and impervious stone, the strata of which are called by the quarrymen foundation-stone.—*C. H. G.*

11. Walls always above or always below water, may, under certain circumstances, be laid without mortar; when between wind and water they never should.—*C. H. G.*

12. "All the mechanical effects that tend to destroy buildings, arise from weight, which acts in an inverse ratio to resistance," says Rondolet. How important then the study of the mutual relations of void and solid, load and support, action and resistance!

13. Weight is a constant force, with which all solid bodies appear to act.

14. All parts of solid bodies fall in a vertical direction.

15. All thrust and lateral pressure, whether in a truss, a buttress, a dome, a vault, or arch, must be resolved into vertical weight.

16. Lines of pressure must always be at right angles to the joints of the beds.

17. The true strength of materials in construction depends rather upon their distribution or their application than upon their quantity.

18. Voids over voids, and solids under solids.

19. He is the ablest constructor, who, with the least surface to his points of support, upholds the greatest weight, uniting strength and economy.

20. The freemasons of the middle ages have established this principle of construction, that, with equal quantities of material, a thin wall with buttresses has greater strength and stability than a thicker wall without.

21. Piers with equal superficies of base, as a circle, a square, an equilateral, and a right-angled triangle, have the following strength approximatively: 100, 93⅓, 86, and 76⅓. A square is to a parallelogram as 100: 95.

22. The strength of a wall depends rather upon its stability, than upon the greater or less hardness of the materials.

23. The stability of solids diminishes in proportion to the height of the centre of gravity.

24. Strength sufficient (for the immediate purpose) is not strong enough, therefore it is better to have too much solidity than too little.

25. Nevertheless all *unnecessary* material is not only wasteful, but prejudicial.

26. No wall, nor framing, nor in fact any piece of construction, ought to be charged with more than two-thirds of the load which it is calculated to bear: in railroads, where the load is variable and concussion takes place, the law is one-third.

27. Tredgold in his essay on cast-iron lays down two leading principles—"That the measure of the resistance of a material to flexure is the only proper measure of its resistance (to a straining force), where perfect form and unalterable position are desirable."

28. And that "the measure of its resistance to permanent alteration is the proper resistance (to a straining force), where flexure is not injurious or objectionable."

29. It is not the fracturing weight which is required in practice: but that weight which will not injure the material.

30. Permanent alteration of form, however slight, is partial fracture.

31. Eaton Hodgkinson, in his supplementary part II. to Tredgold's work on cast-iron, says, "that there is no weight, however small, that will not injure elasticity."

32. A beam will bear twice as much weight distributed over its length, as it would do, if the weight were in the middle.

* From Donaldson's "Architectural Maxims and Theorems" Taylor and Walton, Gower-street.

## POSITION OF THE ALTAR IN EARLY CHURCHES.

A REMARK in one of Mr. Donaldson's lectures at Liverpool has led to a skirmish in one of the local papers. "An Architect" writes—"Mr. Donaldson, in his last lecture at the Collegiate Institution, stated that the practice of placing churches east and west was not ancient; and, in illustration, further stated, that the celebrated church of St. Peter, at Rome, stood north and south, and that the other churches of Rome were placed according to, or accommodated to, the directions of the streets. As regards St. Peter's, Mr. Donaldson is quite wrong, that church actually standing east and west; but St. Peter's and the most important churches of Rome were either built upon the site, or constructed out of the remains of ancient temples, and therefore their position was not a matter of choice; and almost all the minor churches of Rome are of the 16th or 17th centuries. Mr. Donaldson, if he will reflect, will find that *all old* Christian churches are placed east and west, the east end being devoted to the altar, and this custom has been almost invariably followed in Great Britain down to the present time."

"Another architect" replies, "When a critic undertakes to enlighten the public, and to correct the mistakes of others, he should be quite certain of the strength of his position, or he may chance to find he is only exposing his own ignorance. A correspondent who signs 'An Architect,' in the *Mercury* of Tuesday last, finds fault with Mr. Donaldson for stating, in his last lecture, that St. Peter's, at Rome, stands north and south, and that the other early churches of Rome were placed without regard to what is called the orientation of the altar. Your correspondent maintains, on the contrary, that '*all old* Christian churches are placed east and west, the east end being devoted to the altar.'

As it regards St. Peter's, Mr. Donaldson is certainly wrong, as the building undoubtedly stands east and west, but unfortunately for your correspondent's position, the high altar is not at the *east*, but at the *west* end of the church.

With regard to the other early Christian churches of Rome, I will merely quote a passage from the historical essay of the late Thomas Hope, an authority on this subject whom none will dispute, which will fully bear out Professor Donaldson in all he asserted. It will be found in chap. 10, p. 101, third edition.

'The early basilicas were not, as later modern churches have been, directed towards peculiar points of the compass. Santa Maria Maggiore, built by Pope Liberius, who died in 366, faces the east; and at Rome, the directions of the other early churches cross each other in every sense. The custom of submitting to any inconvenience, rather than omit to turn the sanctuaries of churches due east, dates from a later era.'

The matter is in itself of no consequence, but as the Camdenists and Ecclesiologists of the present day attach such prodigious importance to trifles of this kind, it is as well to shew that the early Christian church placed no such value upon them."

## RESTORATION OF STEPNEY CHURCH.

IN accordance with a request on the part of several correspondents, we journied last week to the old church at Stepney, to learn what was being done, and found it completely gutted, preparatory to a general restoration. The galleries, which projected in front of the arcade columns, are taken down, and though unfortunately there are still to be side galleries, these are set back three feet from the columns, and supported independently. The present west gallery, which projects over the space of *two bays of the nave*, is to be removed, and a small one, projecting but a little from the tower, is to be substituted.

The old pew framing in the body of the church, which one of our correspondents feared would be put up again, is to be remodelled, being cut down to the height of 2 feet 8 inches, and to have solid capping, and be otherwise made as like the ancient mode of seating as it will admit of. The materials of the old pewing were too sound, it appears, to be wholly cast aside, but there will be a large proportion of new work. The *ceilings* of the roofs are to be removed, and the timbers exposed and stained, &c. The skylights in the galleries also, are to be taken away, the painted altar-screen to be taken down, and the east window restored and opened: in short, as far as we can learn, the church will be restored to its original state as fully as circumstances will permit. Mr. Ferrey is the architect employed.

The building appears to be in a very shaky state, and needs careful handling.

## THE PROPOSED AQUEDUCT COMPANY

### FOR SUPPLYING THE METROPOLIS WITH PURE WATER.

THE 'admitted existence of a strong necessity for improving the present defective supply of water to the metropolis' has led to the announcement of a project so comprehensive—we had almost said so vast—as actually to call forth an engineer's assurance, that the quantity of water to be ultimately withdrawn for the purpose from the Thames at Bray, would *not* affect the navigation of the river—and certainly such an assurance was more than half necessary since it is proposed to abstract, in future years at least, no less than 50,000,000 gallons out of the whole 200,000,000 at Bray—a fourth part in short,—which it is proposed to conduct into ten subsiding tanks of 5 acres each, and ten filter beds of 2 acres each to be formed as required during the increase of the supplied population, in twenty years, to 3,000,000, at the rate of twenty-five gallons per diem; and thus filtered, this immense volume of water is then to be immediately conducted through a tunnel aqueduct of brick-work 12½ feet interior diameter, based 6 feet under ground, and encased in puddle, to Hampstead-hill, where it will lie perpendicularly raised by ten out of twelve steam-engines of 250-horse power each, working four and four into one central shaft of 30 feet diameter, to an elevation of 250 feet above high-water mark, into four reservoirs, holding 70,000,000 gallons, whence it will be uniformly supplied under a high pressure, through the present or other pipes, to the whole metropolis, not only for domestic and other ordinary purposes, but also for the extinction of fire [and might it not have been added, for the occasional scouring of an extended system of small-bored sewers, even rapidly and with unfiltered water, 'let on' below the filtering reservoirs, and raised into tanks for the purpose?].

In the meantime, it is only proposed to have a sort of skeleton or miniature of this magnificent establishment, suitable however to its ultimate scale, and indeed at once supplying 25,000,000 gallons per diem, for which a revenue of 47,520*l.*, capable of yielding about 5 per cent. on the capital of 550,000*l.*, sunk on

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